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NESTING HABITS OF SPHEX XANTHOPTERUS (CAM.) (HYMEN.)

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Certain of the nesting habits of the wasp, *Sphex xanthopterus* (Cam.)*, have been observed at and near Los Angeles, California. The insect nests for the most part in the moist or wet, sandy soil of the river bed. It digs a short tunnel and enlarges it into a cell at the end. Into this is stored a stung lepidopterous larva, often the young of the moth, *Zale lunata* (Drury)** and its varieties, to the side of which is fastened the egg of the wasp. The entrance to the tunnel and nest is then closed and in due time, if all goes well the egg hatches, the larva devours the prey, spins its cocoon, pupates, and later emerges an adult wasp. A more detailed account of some of the facts in its nesting habits and life history is given below.

Much time is often spent by the wasp in selecting a place at which to start a nest. This includes many short flights, interrupted by long, erratic walks. The soil is tested with her jaws in various places, although few tunnels well started are deserted. The exact time consumed in finding a satisfactory spot is difficult to learn because of the frequent flights which sometimes carry her out of sight. When a site is chosen, she usually works in the following manner.

She bites loose the sand or soil with her mandibles and carries it with them, assisted by the fore legs, to one side or less often to the rear. The first few trips may alternate from side to side of the tunnel but not for long, for she soon selects a definite small area farther away, going to it repeatedly until the nest is dug. The pellets are not piled up in a mound but lie close together in the chosen area. One such area was about six inches away from the entrance to the tunnel. After she had released a load she sometimes made a buzzing noise with her wings, although the frequency of the expression of this habit has been found to vary among the different individuals.

One female, digging in moist, fine sand, finished her nest digging in exactly twenty-two minutes. The tunnel complete, the wasp then went out after a plug of sand. The first one selected broke and fell inside as she worked to fit it in the orifice. This was immediately removed by three trips within. The second plug secured remained intact and fitted nicely. She then scraped loose sand over it until it was completely filled above and well concealed. On a different occasion, when a wasp had finished digging, the piece of dry sand brought to fit the tunnel was too small. This was not released inside but brought out and discarded. She soon returned with a second which likewise was too small but the third fitted exactly and remained.

After concealing the location of the unprovisioned nest by scraping sand level over the plug and smoothing the area about for a distance of two or three

*Kindly determined by Professor H. T. Fernald.

**Identified through the courtesy of Dr. John A. Comstock.

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inches, the wasp often follows a series of actions which may be a locality study. First, she usually walks very near the nest and circles entirely around it with her head almost always toward the place where she has been working; then, she moves farther away until at about two feet distant she may confine herself to one side only. She may continue as far as ten feet away, then return to the nest and move away on the other side in the same manner. She continues now with short flights or hops, turning her head towards the nest, then proceeds farther and farther away, flying until lost from sight in the willows. There has been found considerable variation in this habit but it consists, in general, in circling the nesting site until the wasp has covered much of the territory about it.

It appears that the female may continue to dig her cell even though old and near the end of her days. One found on September 25th presented an almost pitiful spectacle although one could not help but admire her spirit. She was found excavating, her wings frayed and torn and her body so weak that she actually staggered as she walked. She was painfully digging, taking out small, miserable loads which she dropped less than two inches away. She had begun a task which surely could not have been finished, for upon my approach she could not fly from the ground but fell over and over in the attempt.

A nest under normal conditions, is usually but not always finished. The comparatively small numbers of unfinished burrows left by this wasp may be due in part to the favorable nature of the place where she has been most observed; namely, in fine moist sand or soil with much sand in it and nearly free from large pebbles or rocks. Although she may nest in hard soil occasionally, digging a shorter tunnel and smaller cavity, there is little evidence that she deserts many after they are once begun. The diggers, *Sphex aberti* (Hald.), often nesting in hard soil with many rocks in it, or *Podalonia violaceipennis* (Lep.), nesting in fine, dry sand, meet with more difficulties. The former species may be compelled to stop because of an encounter with a hidden rock, the latter may have to change her position many times because of sand slides.

The tunnel of one nest, apparently average in size, measured 7 mm. in diameter on the surface. A little below this it narrowed a trifle, then continued quite uniform until the widening near the cavity where the prey is stored. This cavity varies from a depth of 28 mm. (the depth of a cavity dug in very hard soil) to 65 mm., the depth appearing to depend to a large extent on the type of soil in which the cell is formed. The average seems to be about 55 mm. The prey is twisted in the cell, amply large for its reception, until its head and tail meet or nearly touch. It normally lies on its side, probably being unable to turn over or move about to any extent in its subterranean tomb.

The capture and stinging of the prey of this wasp has been witnessed a number of times, an account of which may be given in a later paper. It suffices to say that at the time the prey is transported to the nest it is in a very helpless condition, having been stung at least five or six times on its ventral side and possibly in nerve ganglia. It is grasped for carrying by the jaws of the wasp with its ventral side to her, the support being increased by the use of one pair of the wasp's legs about its body.

The wasp goes direct although not exactly in a straight line to the nest with her prey. The greatest distance she has been seen carrying it has been fifty feet but there is evidence to cause one to suspect that it may be much greater. She has been followed many times during the last part of her journey. She returns to a nest with wonderful accuracy, usually releasing the prey with its head just touching the concealed nest. In only two instances has she been seen to miss the spot and that by but less than two inches.

Arriving at the nest she releases the prey, scrapes from before it a little loose sand, grasps a pellet with her mandibles, removes it and there is the opening to a tunnel not before obvious. She returns to it readily, a spot in the open sands, sometimes many feet from bush, twig, or stone although again somewhat near to a possible landmark. In finding it upon her return, she cannot tap the ground so well with her antennae on the way since the load interferes with an act she frequently executes at other times when walking.

The pellet away and the tunnel open, she walks head first down the shaft and soon emerges with some loose sand which had probably just fallen in or which had done so while she was earlier placing the plug. This material is deposited an inch or so away. Then returning, she backs into the hole, grasps the fore part of the larva and pulls it slowly out of sight. In about a minute she is out, the prey having been arranged in its dismal hole and an egg placed on its side.

The next task is to fill the tunnel for she uses but one larva at a given nest as prey. She usually begins to do this by carrying and arranging within, a few large pellets or chunks of sand. Fine, dry material, mostly sand is scraped in and packed. As she packs it, she often makes a humming noise which can be heard readily and as far as twenty feet away. The filling in of the tunnel entrance presents some interesting facts and individual variations, a few of which will be given.

While working at closing the tunnel the wasp constantly moves her antennae which tap the surface. This is true also when she walks about on the ground looking for a nesting site or when she searches among the willow leaves for her prey. The dry sand or loose material is scraped in by the fore legs, the tarsi of which are bent like a bow and used after the fashion of wasps of the genus *Bembex* and others. Bembex, however, has longer and stiffer fringes of hair which help to make a better scoop.

The wasp, as a rule, finds but little dry sand on the surface and must dig for the rest when nesting in the wet sand. To obtain sufficient material to fill the tunnel she uses her mandibles to excavate, forms a good-sized pellet and carries it quickly to the nest. Between the jaws of the wasp and the anterior part of the thorax a quantity of material can be held and by calling to aid the fore legs, still more can be carried. Thus the digger is able to transport pellets which measure around 2 by 3 by 5 mm. These are usually obtained, after the first two or three, from a definite source, an ever enlarging tunnel or cavity near at hand.

The sand is placed in the tunnel and spread out by her jaws. She then packs it, usually after each load although she sometimes waits until after two or more have been carried. When the tunnel becomes nearly full, her method

of work may easily be observed. Her jaws are held parallel with the sides of her head so that by moving her body up and down her jaws and head beat the sand. At the same time her wings vibrate rapidly, producing a buzzing sound.

The wasp uses a pebble as a tool in filling the entrance to the tunnel, especially in the later stage of the work. I have observed this phase of the work of *S. xanthopterus* a number of times and she has always been found to use a pebble or suitable object to pound down the sand or the material previously employed. Sometimes the tool is used before the tunnel is full, again it is not, but always near the end of the task. The period of use is usually comparatively long but it varies with the individual and with the nesting conditions. This species does not use the pebble, however, so successfully as does *S. aberti* (Hald.) The latter wasp uses, for the most part a larger pebble, more carefully selected and put to a more telling effect. All the observed nests of *S. aberti* have been in soil containing much coarse sand, the surface of which, covered with a large assortment of pebbles, gave her greater opportunity of obtaining more efficient tools.

The immediate areas about the nests of *S. xanthopterus* are often almost free from pebbles of size, a condition which compels the wasp to search about for a stone which will meet her requirements. She therefore sometimes uses quite small pebbles although before the nest is complete she will have found a few good ones. After using a given pebble for a time, more loose sand is scraped in or over the tunnel and it or another stone again employed. This is repeated again and again or until the nest is complete.

The method of work is to pound the sand with up and down strokes, accomplished by an alternate raising and lowering of her head and body. The method of pressing and vibrating the pebble in place is also employed to a large extent. After using a given pebble for a time, she would release it in place or deposit it nearby. If left in place, fresh sand would partly cover it, and she would be compelled to find another. If deposited near, she would search on her return to this phase of the work until a pebble was found, which might or might not be the last one used.

The sand having been packed over the entrance to the tunnel to her satisfaction the wasp proceeds, in such instances where a cavity has been dug in securing additional material to finish the nest, to fill likewise this sporadic tunnel. The method, in the instance here cited, was much the same as in that of the tunnel of the nest and resulted in a second cavity near at hand. When the first had been filled she used a pebble in packing it, as she had done over the original tunnel. This pebble was not hastily discarded but used many times. Later, others were used in its place and in the end she had given the surface above the pit nearly as much time and attention as she had given that of the tunnel under which later was to develop her young. She then began on the second cavity, which being much smaller and with sufficient loose sand about, was quickly filled. No pebble was used to pack it down.

In accordance with the habits of many species of wasps, this digger usually acts to conceal the location of the nest site after the tunnel has been filled, although some workers give it little or no further attention. At any rate the nesting female engages in a series of activities which seem to indicate this, or may be interpreted as tending to conceal the place. Her method consists in the main, in scraping

back with her fore feet any loose material near and later in carrying pellets of sand, pieces of wood or debris, pebbles and the like, and placing them over the nest. In doing this she walks out from the nest site into the surroundings and finds a piece of dry sand or other material, sometimes quite small, or again massive, a weight so great that she can barely stagger back with it to her nest. After grasping it with her mandibles she would sometimes seem to start as though intending to walk backward, then quickly turn about and walk forward. There was nearly always displayed this slight hesitation. The material is sometimes placed over the secondary cavity rather than over the original tunnel. After this is accomplished, the area about may be smoothed for a few inches distant, followed by a brief circling about on the wing.

The wasp lays a single egg on a given larva and attaches it to the side of the abdomen, usually near a spiracle. The position near a spiracle is probably due to chance and perhaps not due to instinct. The base of the egg is apparently fastened by a sticky secretion for it will break from a jar or jolt before it will fall off. The egg has always been found on an abdominal segment but the particular segment to which it is attached, varies. Records show that it may be placed on the first to the fourth segments but most often on the second.

A number of nests have been dug out, the prey with attached egg secured and brought home or to the laboratory where development was watched and recorded. In California, near the sea, where the air is usually quite moist, the wasp's egg hatched and developed well even though out of its natural wet cell. A prey with a wasp egg attached taken at one o'clock on August 7th may serve as an example and illustrate certain facts of development at a varying room temperature. The prey, constituting the sole food supply, measured 48 mm. in length and between 4 and 5 mm. in width. The egg, glued to the side of the second abdominal segment, was light in color throughout its length, with the exception of the attached point which appeared somewhat dark. This egg measured 3 mm. in length and nearly one millimeter in width at the free end, being somewhat smaller at the attached.

By noon of August 10th the egg had hatched into a larva, which by 8 p. m. of the 11th measured 5 mm. in length and slightly more than 2 mm. in width at its widest point (just posterior to the middle of the body). Soon after the hatching of the egg, a stained area was seen about the anterior end of the larva, a region where the body fluids of the prey had oozed out and dried. This area measured 3 mm. in diameter when the small larva was thirty hours old. By August 12th the larva had increased much in size, attached to the same spot, with its body somewhat curved about the prey. On the evening of the 14th it finished eating the prey, having devoured all with the exception of the skin and hard parts of the head and legs.

Early the next morning, when first observed, it had barely begun a cocoon. It moved from one side of the test tube, in which it had developed, to the other, back and forth, this way and that way, forming a framework of rather tough and heavy threads which later helped to hold and support the inner cocoon. When spinning, the larva was sometimes on its dorsal side, moving its head back and forth above it, or again, on its ventral side, twisting its head beneath a fat and clumsy body. It would work with its head at one end of the structure for a

time, then change and work at the other. A day later the cocoon was complete, or at least it was so thick and dark that activity could not be seen inside.

A mature, adult wasp issued from this cocoon on September 10th, a month elapsing from the time of the laying of the egg to the emergence of the insect. She chewed a jagged end off the cocoon and came forth, a fine lively specimen in excellent condition. In order to get some data on her sleeping habits, the wasp was placed in a large glass jar in which some dry stems had been placed. When night came on, or if she were placed in a dark closet during the daytime, she would attach herself to the stems with her long mandibles and rest during the period of darkness. While holding with her jaws she would elevate her abdomen until it rested beneath her folded, parallel wings while she grasped tightly the stems with her legs. This appears to be the normal resting position of *S. xanthopterus,* for it was observed many times in this and other individuals. She differs somewhat in this habit from *S. aberti* and others which support the body solely, or in a large part by their mandibles while holding the legs free against the body. It seems reasonable to assume that *S. xanthopterus,* when free to find a resting place in the open, selects a twig or stem and holds on to it with her jaws and legs. She has never been found resting in her tunnel for it is always plugged when empty and sealed at once when closed.

There appears to be at least two generations a year of this wasp in southern California and possibly more. Considerable other data than those included in this article have been secured in regard to the habits of this species, some of which will be presented later.

ADDITIONAL NOTES ON THE COLEOPTERA OF THE NORTH SHORE OF THE GULF OF THE ST. LAWRENCE*

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During the summer of 1930, I returned to the north shore of the Gulf of the St. Lawrence and spent three months collecting there. Most of the collecting was done at Thunder River, a village on the mainland opposite the western end of Anticosti Island, and at Bradore Bay, situated at the western extremity of the Straits of Belle Isle. The purpose of the present list is to supplement that which I compiled from the material collected in the same region in 1929 (1930, Can. Ent., LXII, 231-237 and 239-246). A few additions and corrections have been included from the material taken in 1929, but dates in the following list are for 1930 unless otherwise noted. The specimens of the genus *Colon* and of the Aleocharinae are still undetermined and have not been included in the list. Except where otherwise stated, determinations have been made by myself.

Bonne Esperance, a locality visited in 1929, and Bradore Bay are included in the region considered by Mr. John D. Sherman, Jr., in his list of Labrador Coleoptera (1910, Jour. N. Y. Ent. Soc., XVIII, 173-197). My records from these localities may therefore be of interest in connection with Mr. Sherman's list.

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*Contribution from the Division of Systematic Entomology, Entomological Branch, Dept. of Agric., Ottawa.

CICINDELIDAE

Cicindela longilabris Say 17, Thunder River, June 27 and Aug. 21-28. In ten of these specimens, the ground color of the elytra is black, in seven bronzed-brown. There is an imperfect tendency for this bronzed form to grade into the black form and into the variety *novaterrae* listed below. All forms occurred together.

Cicindela longilabris novaterrae Leng. 3, Thunder River, Aug. 21-30; 2, Natashkwan, July 19 and 25. Two of the Thunder River examples have a slight brownish cast on the elytra and therefore tend to grade into the bronzed form noted above.

CARABIDAE

Carabus maeander Fisch. 3, Bradore Bay, July 9-16.

Carabus groenlandicus Dej. 1, Bonne Esperance, July 14, 1929; 2, Bradore Bay, July 9 and 16. This is the *Carabus* sp. of my previous list.

Loricera neoscotica Lec. 2, Thunder River, June 18 and Aug. 25; 1, Natashkwan, July 25.

Notiophilus aquaticus L. 3, Thunder River, Aug. 20 and 21; 1, Bradore Bay, July 16.

Dyschirius sp. 1, Thunder River, Aug. 23.

Bembidion carinula Chd. 22, Thunder River, June 27; 7, Natashkwan, July 23.

Bembidion graciliforme Hayw. 1, Thunder River, June 19.

Bembidion decipiens Dej. 2, Thunder River, June 18 and 25.

Bembidion sulcatum Lec. 3, Thunder River, Aug. 22 and 23.

Patrobus septentrionis laeviceps Csy. 1, Bradore Bay, July 8. The specimen agrees well with the original description. If the identification is correct, *laeviceps* is certainly a valid species. The specimens of *Patrobus* recorded in the previous list are of the form described as *labradorinus* Csy. and agree well with topotypical specimens of the latter.

Trechus micans Lec. 1, Thunder River, June 19; 23, Bradore Bay, July 7. According to Jeannel (Ann. and Mag. Nat. Hist. s. 9, V, 104), the name *micans* must be applied to our northeastern species. In some of the Bradore Bay examples, the posterior pronotal angles are very slightly more prominent than in others. However, there is surely not more than one species represented. The series agrees well with examples from Portaupique, N. S. (C. A. Frost) and Cochrane, Ont. In all of these specimens, the pronotal length measures from .74 to .76 the width, and the fourth antennal segment is very slightly longer than the second.

Curtonotus labradorensis Csy. 32, Thunder River, June 23 and Aug. 15-20; 16, Bradore Bay, July 4-16 and Aug. 2. These specimens are of the species recorded in the previous list as *labradorensis* and *scrutatus* Csy. The variation shown by the series at hand indicates that *scrutatus* is probably a synonym of *labradorensis*.

Curtonotus brunnipennis Dej. 1, Bonne Esperance, July 14, 1929. This specimen agrees with a long series from Hopedale, Labr., which is undoubtedly of the species recognized as *brunnipennis* by Casey.

Bradytus apricarius Payk. 2, Thunder River, June 18 and 23.

Bradytus fulvus DeG. 3, Thunder River, Aug. 26; 1, Natashkwan, June 22, 1929. This species has not been recorded previously from North America unless the doubtful Newfoundland record, found in Leng's Catalogue, of *Curtonotus fulva* DeG. refers to it. The Natashkwan specimen was recorded as *exaratus* Say in my previous list. The specimens have been compared with two European examples sent by Mr. Nathan Banks, and I can discover no characters for separating them from the latter. In Hayward's key (Trans. Am. Ent. Soc. XXXIV, 38), the species falls with *apricarius Payk.* but is larger than the latter and differs from it and from *exaratus* Say and *latior* Kby. in having the pronotum much shorter and the strial punctures of the elytra much finer. The color of *fulva* is quite characteristic. Our specimens may be described briefly as follows: Length 8.6 mm. to 9.2 mm.; width 3.8 mm. to 4 mm. Body rather broad and moderately convex. Color reddish-yellow, the elytra darker and with a feeble aeneous tint. Head three-fifths as wide as the pronotum; the eyes not quite as prominent as in *latior* and *apricarius*; the frontal grooves not extending upon the clypeus; antennae extending slightly beyond the posterior pronotal angles. Pronotum short and wide the length equal to three-fifths the width, widest at middle, the width across the anterior angles three-fourths as great as the width across the posterior angles; the side margins much more broadly reflexed than in *latior* and *apricarius,* distinctly sinuate before the posterior angles; these angles a little less than right, very sharp. Disk with the anterior transverse impression very feeble; the median impressed line very distinct and almost attaining the apex; each basal impression broad, distinctly bifoveate; the fovae moderately deep, the inner a little longer than the outer, the outer limited externally by a very obtuse carina; basal impressions and usually the disk between them closely, not coarsely punctate, the disk elsewhere impunctate. Elytral striae punctate at base, the punctures indistinct at middle and absent on apical third; the scutellar striae long; intervals mico-reticulate, more distinctly so in the female. Median area of prosternum punctate but not depressed or flattened in the male, impunctate and feebly flattened posteriorly in the female; prosternal episterna impunctate; meso- and metasternal episterna with coarse, shallow, sparse punctures; the metasternum similarly punctate on the sides. Male hind tibia with a very narrow pubescent area extending over apical three-fifths.

Celia remotestriata Dej. 1, Thunder River, Aug. 20.

Celia subaenea Lec. 3, Thunder River, June 27 and Aug. 20 and 22.

Celia sp. 1, Thunder River, June 13.

Amara enervis Csy. (?). 1, Thunder River, June 23.

Agonum placidum Say 1, Thunder River, Aug. 20.

Sericoda obsoleta Say 3, Thunder River, June 16-23; 1, Bradore Bay, Aug. 7.

Lebia moesta Lec. 2, Thunder River, June 16 and 25.

Blechrus americanus Dej. 1, Natashkwan, July 25. The specimens recorded in the previous list as *glabratus* Duft. belong here.

Cymindis cribricollis Dej. 23, Thunder River, June 14 and Aug. 20-22; Bradore Bay, July 7.

Harpalus rufimanus Lec. 1, Thunder River, June 25.

Harpalus pleuriticus Kby. 3, Thunder River, June 13 and Aug. 20.

Catharellus cordicollis Lec. 2, Thunder River, June 21 and 23.

HALIPLIDAE

Haliplus cribrarius Lec. 1, Thunder River, June 17.

DYTISCIDAE

Coelambus punctatus Say 6, Thunder River, Aug. 20 and 28; 8, Natashkwan, July 23.

Coelambus quebecensis Br., 28, Natashkwan, July 19 and 23; 30, Bradore Bay, July 11 and 14.

Hydroporus carolinus Fall 11, Thunder River, June 18 and Aug. 18-28; 1 ♀, Bradore Bay, July 7.

Hydroporus paugus Fall 10, Thunder River, June 23 and Aug. 28.

Hydroporus brevicornis Fall 25, Thunder River, June 26 and Aug. 18; 69, Bradore Bay, Aug. 8 and 12. The Thunder River examples measure from 3 to 4 mm.; those from Bradore Bay vary from 2.7 to 3.2 mm. This species evidently decreases in size toward the more northern parts of its range as does *Agabus ajax* Fall.

Hydroporus rectus Fall 21, Thunder River, June 20-26 and Aug. 18.

Hydroporus arcticus Thoms. 2, Thunder River, Aug. 28; 58, Bradore Bay, July 13 and Aug. 4 and 8. The Bradore Bay examples vary in length from 4.3 to 5.3 mm.; there seems to be no character by which the largest examples may be separated from *notabilis* Lec.

Hydroporus fuscipennis Schaum. 1, Natashkwan, July 19; 29, Bradore Bay, July 30-Aug. 8. Eleven of the specimens are females. In ten of these, the elytra are very distinctly alutaceous and dull throughout; in one they are dull only on the apical third. In our large series of females from other parts of Canada, the elytra are dull only at their extreme apices.

Hydroporus tristis Payk. 160, Thunder River, June 18-26.

Hydroporus depressus Fab. 41, Thunder River, June 16-22 and Aug. 22; 1, Bradore Bay, July 13.

Hydroporus septentrionalis Gyll. 5, Thunder River, June 16.

Agabus punctulatus Aube. 4, Bradore Bay, July 29 and Aug. 4. There are two individuals of each sex. The females do not differ from the males in sculpture. Otherwise the specimens agree perfectly with the series in the National Collection, all the females of which are opaque.

Agabus ambiguus Say 46, Thunder River, June 18 and Aug. 28.

Agabus confinis Gyll. 14, Bradore Bay, July 4 and 13 and Aug. 8 and 12.

Agabus infuscatus Aube. 26, Thunder River, Aug. 20-27; 74, Bradore Bay, July 13 and July 29 to Aug. 12.

Agabus anthracinus Mann. 35, Thunder River, June 14-18 and Aug. 28; 34, Bradore Bay, July 5-13.

Agabus ajax Fall 33, Bradore Bay, July 31 and Aug. 1 and 8. These specimens measure from 7.5 to 8.6 mm. in length, the largest being equal in size to our smallest example from Alberta.

Ilybius subaeneus Er. 6, Bradore Bay, July 31 and Aug. 1.

Ilybius pleuriticus Lec. 5, Thunder River, June 18-25 and Aug. 28; 29, Bradore Bay, July 5-7 and Aug. 1-9.

Ilybius discedens Shp. 9, Bradore Bay, Aug. 8-12.

Rhantus binotatus Harr. 5, Thunder River, June 18 and Aug. 27.

Rhantus sp., near *bistriatus* Bergst. 28, Thunder River, June 22-26 and Aug. 27; 2, Natashkwan, July 23.

Rhantus sp., near *bistriatus* Bergst. 32, Thunder River, June 22-26 and Aug. 27-28; 13, Bradore Bay, July 4-16 and Aug. 1. This and the preceding are the same species recorded as near *bistriatus* in the previous list. Both have been taken at Bradore Bay, the one in 1929, the other in 1930.

Colymbetes sculptilis Harr. 8, Bradore Bay, July 4-13 and 31.

Dytiscus dauricus Gebl. 1, Thunder River, Aug. 27; 1, Bradore Bay, July 7.

HYDROPHILIDAE

Helophorus sp. 4, Bradore Bay, July. 7.

Hydrobius fuscipes L. 3, Thunder River, Aug. 28; 8, Bradore Bay, July 13 and Aug. 12.

Cymbiodyta vindicata Fall 1, Shelter Bay, June 11; 1, Thunder River, Aug. 20.

Cercyon unipunctacus L. 31, Thunder River, June 25 and Aug. 18-28.

Cercyon sp. 5, Thunder River, Aug. 21-27; 3, Natashkwan, July 23. This is the species included in the previous list as *marinus* Thoms.

Cercyon sp., near *quisquilius* L. 3, Thunder River, Aug. 22 and 23.

Cercyon sp. near *analis* Payk. 5, Thunder River, Aug. 21-25; 1, Natashkwan, July 23.

Cercyon sp. near *tristis* Illig. 1, Thunder River, Aug. 21.

SILPHIDAE

Nicrophorus defodiens Mann. 1, Natashkwan, July 25; 1, Bradore Bay, July 15.

LEIODIDAE

Hydnobius substriatus Lec. 210, Thunder River, Aug. 19-28.

Hydnobius latidens Lec. 73, Thunder River, Aug. 22-28.

Hydnobius validus n. sp.

Male. Length 3.7 mm.; width 2 mm. Broadly oval, strongly convex. Reddish brown and shining throughout.

Head almost three-fifths as wide as the pronotum; finely and closely punctate; the vertex with a very indistinct impression; the margins over the antennal bases not at all reflexed as in *matthewsii;* the front margined and not emarginate behind the labrum; the clypeus not visible; labrum broadly and deeply emarginate; mandibles only moderately prominent, much less so than in *matthewsii.* Third antennal segment equal in length to the second, a little shorter than the two following.

Pronotal length equal to three-fifths the width, the pronotum widest at basal two-fifths, the sides obliquely converging anteriorly; all the angles obtuse and very broadly rounded; the entire margin with a continuous, distinctly impressed marginal line. Disk without impressions, finely punctate, the punctures regularly distributed and usually separated by about twice their diameters. Scutellum more closely, less finely punctate.

Elytra subparallel in basal half; the striae moderately impressed, closely and rather coarsely punctate; intervals feebly convex, very finely punctate, the

punctures separated by about twice their own diameters.

Spurs of anterior tibiae short and slender; middle and posterior femora rather closely and coarsely punctate. Middle coxae very narrowly separated. Metasternum with moderately coarse and close punctures, a large median area and a transverse area at the hind margin on each side impunctate. Abdomen finely and densely punctate, each puncture with its anterior margin elevated giving the surface a granulate appearance.

Male characters: anterior and middle tarsi very feebly dilated. Ventral posterior margin of middle femur with a tooth about one-third from apex, the tooth rather small, triangular, a little wider than long, and very acute. Hind femur with a tooth at apical third of the ventral posterior margin; the tooth moderate in size, triangular, a little longer than wide, and very acute, its distal margin forming a concave arc with the femoral apex; the dorsal posterior margin of the femur very obtusely subangulate midway between tooth and base.

Female. Anterior and middle tarsi not dilated; all the tibiae similar to those of the male; middle femur more slender than that of the male, not toothed; posterior femur oval but less broadly so than in the male, the posterior margins simple.

Holotype—♂, Thunder River, Que., August 27, 1930, (W. J. Brown); No. 3223 in the Canadian National Collection, Ottawa.

Allotype—♀, same data as holotype, August 21, 1930.

Paratypes—5♀, same data, August 22 to 27 and June 25, 1930.

The paratypes range from 3.8 to 4 mm. in length, and the individual collected in June is pale reddish-yellow in color. This fine species is not closely allied to any other, but should be placed near the elongate *matthewsii* on account of the emarginate labrum, approximate middle coxae, and the distinctly striate elytra. The puncturation of the pronotum and elytra is quite similar in the two species, but in the type series of *validus,* there is no subrugose sculpture on the elytra. The present species differs also in having the pronotal angles much more broadly rounded, the femora more robust and sexual characters of a different type. I know of no other species in which the middle femora are toothed in the male.

The genus *Leiodes* of the following list is that designated as *Anisotoma* in the North American literature. Dr. Melville Hatch has shown recently that our previous use of these generic names was incorrect.

Leiodes valida Horn. 61, Thunder River, Aug. 20-28.

Leiodes assimilis Lec. About 300, Thunder River, Aug. 20-28; 1, Esquimaux Point, June 13, 1929, recorded as *Anisotoma punctatostriata* Kby. in the previous list; 1, Natashkwan, Aug. 1, 1929, recorded as *Anisotoma* sp. in the previous list; 7, Bradore Bay, Aug. 4 and 8.

Leiodes collaris Lec. 27, Thunder River, Aug. 19-28; 1, Bradore Bay, July 22, 1929, recorded as *Anisotoma* sp. in the previous list.

Leiodes conferta Lec. 8, Thunder River, Aug. 22-27.

Leiodes impersonata n. sp.

Male. Length 2.5 mm.; width 1.5 mm. Oval; moderately robust and convex. Reddish-yellow, the antennal club darker; strongly shining.

Head slightly more than half as wide as the pronotum; finely and sparsely punctate; the front with two very inconspicuous coarse punctures on each side. Antennae rather long, extending to basal fourth of pronotal side margin; the second segment two-thirds as long as the third, the third as long as the fourth and fifth, the club four-fifths as long as the stem.

Pronotum slightly more than half as long as wide, widest at base; the sides moderately and evenly arcuate and strongly narrowed to apex; the basal margin straight; the hind angles obtuse but not broadly rounded. Disk finely and very sparsely punctate, the punctures becoming less fine and rather close at the basal margin and hind angles, these parts without series of much coarser punctures. Scutellum rather finely and closely punctate.

Elytra with the sides moderately arcuate and almost continuous with those of the pronotum, widest at basal third. Striae except the sutural in apical half not impressed, represented by rows of close, moderately coarse punctures, the eighth attaining the base, the subhumeral moderately long; intervals perfectly flat, their punctures less close and slightly finer than those of the striae, the alternate intervals without coarser punctures.

Mesosterum oblique, strongly carinate. Metasternum at middle very finely and densely punctate, with a large median impunctate area which does not attain the anterior margin, the sides alutaceous and with a few indistinct punctures. Abdominal segments each with two irregular rows of fine and close punctures, alutaceous.

Male characters: anterior and middle tarsi slightly dilated. Posterior femur slightly widened to apex, the posterior margin simple and unmodified, forming a very obtuse angle with the rounded apical margin at the outer condyle, this angle not produced; the inner condyle obtusely lobed. Posterior tibia strongly and evenly curved throughout its length and gradually widened apically in apical half.

Female. Anterior and middle tarsi not dilated. Outer condyle of posterior femur not angulate, the inner condyle very feebly lobed. Posterior tibia straight, unmodified.

Holotype—♂, Thunder River, Que., August 26, 1930, (W. J. Brown); No. 3225 in the Canadian National Collection, Ottawa.

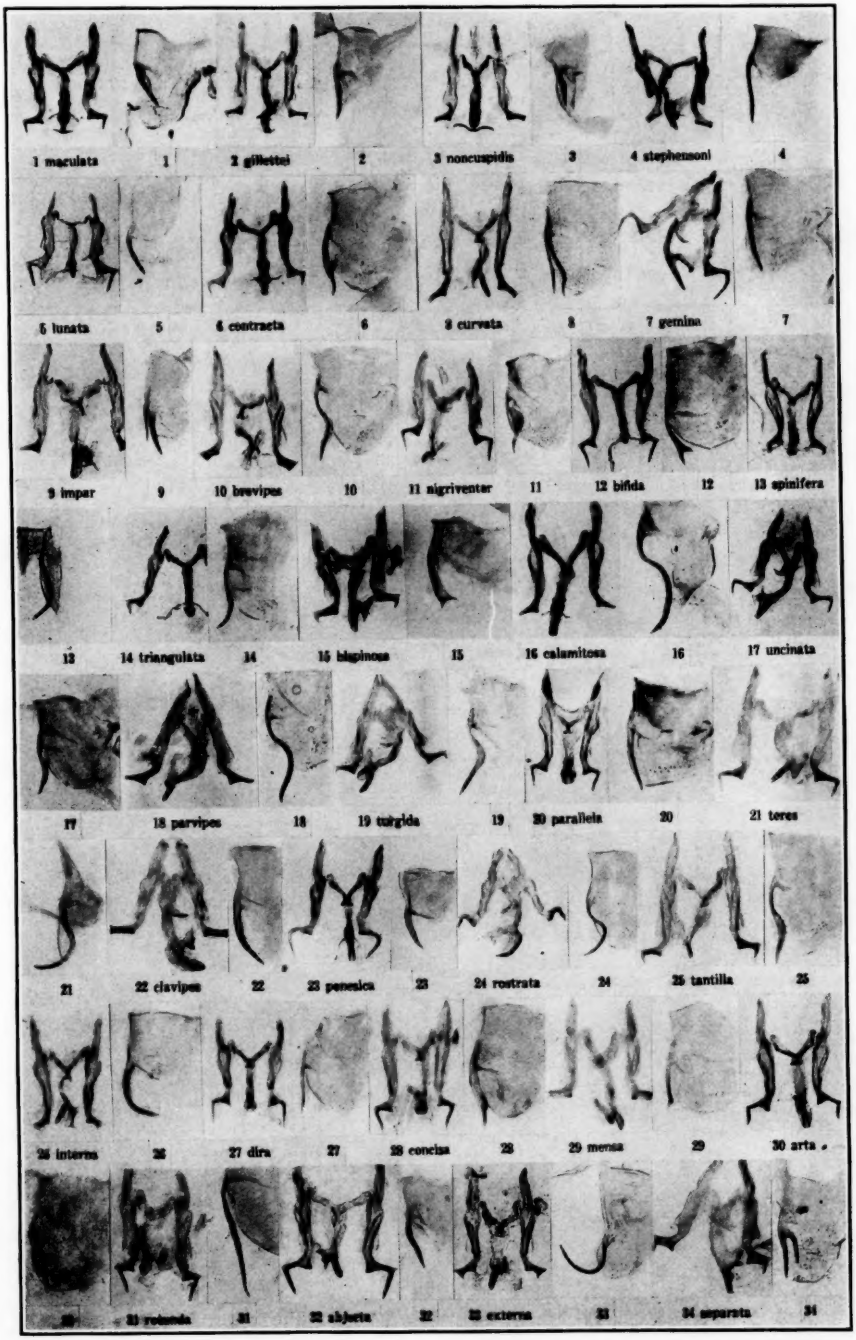
Allotype—♀, same data.

Paratypes—2 ♀, same data August 19 and 27, 1930.

The type series shows almost no variation. The holotype is evidently a well developed male. The species is closely allied to *conferta* Lec. and falls with the latter in Horn's table. In *impersonata*, the sides of the elytra are more strongly arcuate, and the punctures of the elytral intervals are a little less coarse as compared with those of the striae. The characters of the male posterior femora will always separate the two species, as the outer condyle is distinctly unciform even in feeble males of *conferta*. In the latter species also, the punctures of the metasternum at middle are only moderately fine and close.

Leiodes bradorata n. sp.

Female. Length 2.7 mm.; width 1.4 mm. Oval, elongate, rather feebly convex. Rufous, the head, pronotum, and antennal club darker.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11 nigriventer 11
12 bifida 12
13 spinifera
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14 triangulata 14
15 bilginosa 15
16 calamitosa 16
17 uncinata
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18 parvipes 18
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22 clavipes 22
23 penesica 23
24 rostrata 24
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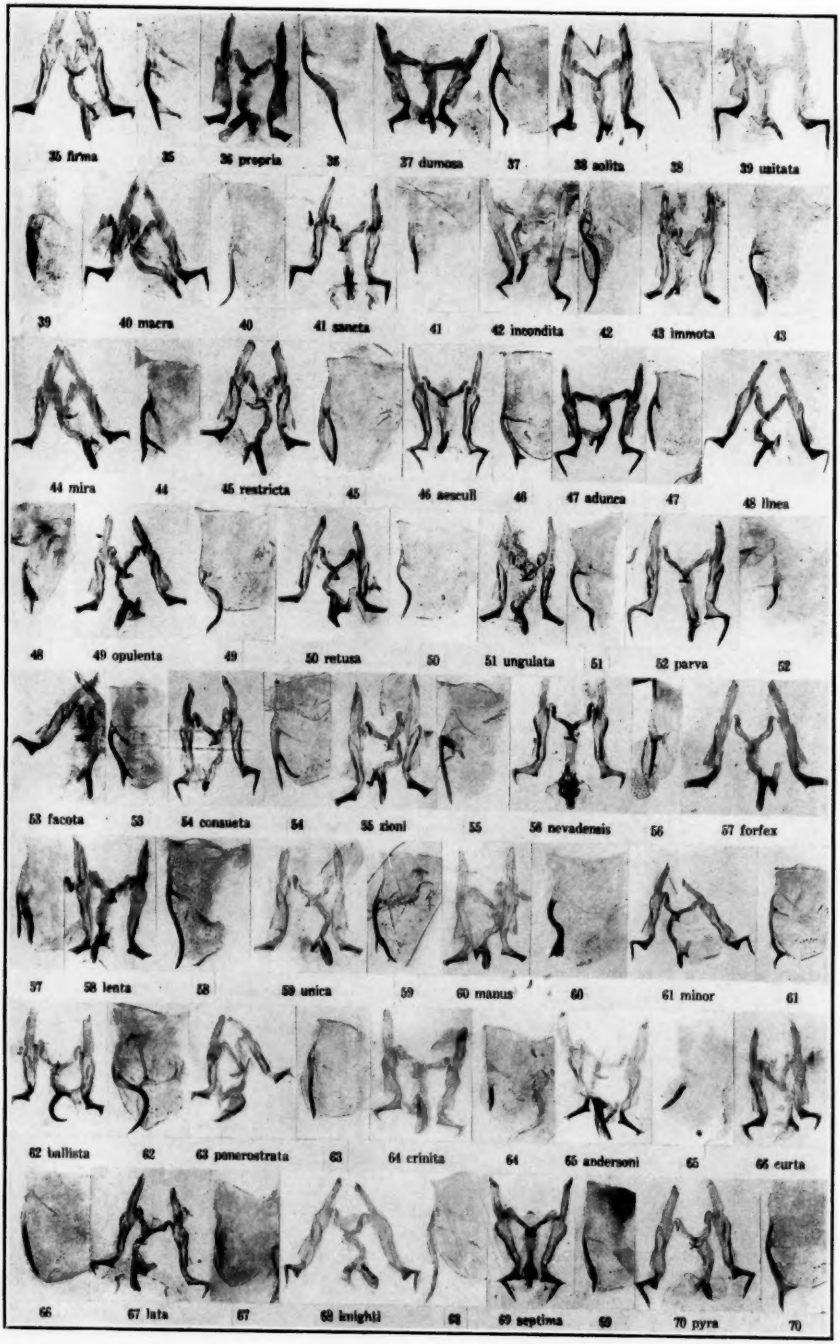
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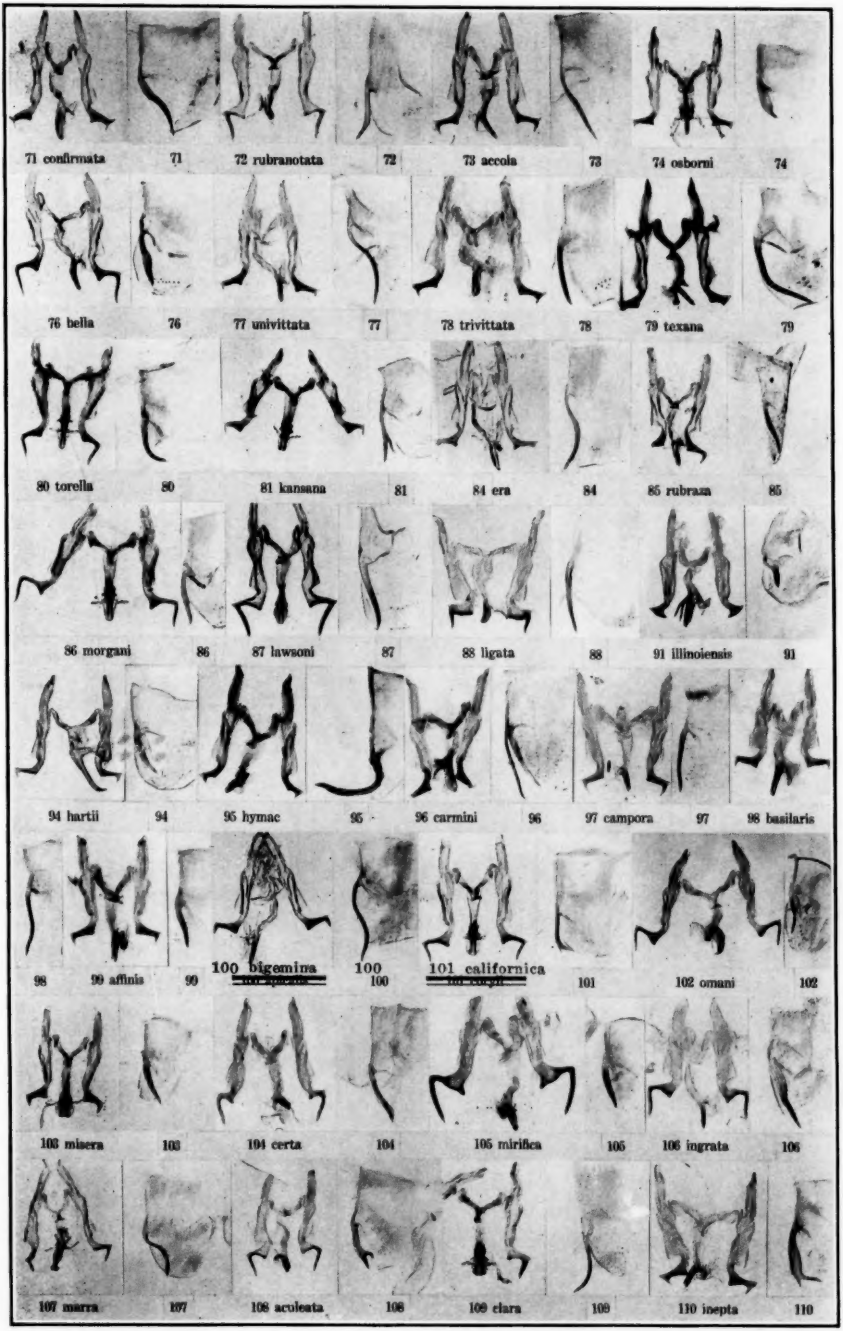
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Head slightly more than half as wide as the pronotum; finely and rather sparsely punctate, the front with two coarse punctures on each side; antennae extending to basal fourth and pronotal side margin; the second and third segments equal in length and each slightly shorter than the fourth and fifth together, the club and stem subequal in length.

Pronotum three-fifths as long as wide, widest at base; the sides moderately and evenly arcuate and strongly narrowed to apex; the basal margin straight; the hind angles obtuse but not broadly rounded. Disk sparsely, rather finely punctate, the punctures not coarser or closer at base, the base except at middle with an irregular series of coarse punctures. Scutellum with a few fine punctures.

Elytra widest at middle, the sides rather feebly accurate and almost continuous with those of the pronotum. Striae except sutural in apical half not impressed, represented by rows of moderately coarse punctures; the eighth attaining the basal margin, with the punctures less close at base and there separated from the seventh by very little more than the width of the punctures; the subhumeral moderately long but near the lateral margin throughout its length; intervals flat, each with an irregular row of very fine, indistinct punctures, the alternate intervals with a few coarse punctures.

Mesosternum oblique, strongly carinate. Metasternum and abdomen not distinctly alutaceous; the former with a few very fine, indistinct punctures; each segment of the latter with a row of very fine, close punctures, the rows double at the sides.

Female characters: anterior and middle tarsi not dilated; posterior femur simple; the posterior tibia straight.

Holotype—♀, Bradore Bay, Que., August 4, 1930, (W. J. Brown); No. 3226 in the Canadian National Collection, Ottawa.

Paratypes—3 ♀, same data.

The paratypes measure from 2.3 to 2.6 mm., and one is pale rufo-testaceous in color. The species resembles *conferta* Lec. in body form, but on account of the short third antennal segment, must be associated with *alternata* Melsh. and *canadensis* Brown. The elongate body with continuous margins and the proximity of the seventh and eighth elytral striae at base are characters not found in the other species of this group.

Leiodes potens n. sp.

Male. Length 3.1 mm.; width 2 mm. Broadly oval, very convex; reddish-yellow.

Head slightly more than half as wide as the pronotum; finely and sparsely punctate, the front without coarse punctures; antennae extending to middle of pronotal side margin; the third segment very little longer than the second, the eleventh truncate at apex and twice as wide as long.

Pronotum three-fifths as long as wide, widest at middle, the sides strongly arcuate; basal margin feebly arcuate at middle, very distinctly so near the hind angles, the latter very obtuse but not rounded and therefore very distinct. Disk very finely and rather sparsely punctate, without coarse punctures at base. Scutellum very finely punctate.

Elytra widest at middle; the sides subparallel and very feebly arcuate, not continuous with those of the pronotum; striae very feebly impressed, closely not very coarsely punctate, the eighth attaining the base, the subhumeral lacking; intervals flat, punctate, the punctures similar to those of the pronotum in size and distribution; alternate intervals with very few inconspicuous, coarse punctures.

Mesosternum carinate, vertical between the coxae. Metasternum coarsely punctate, the punctures sparse posteriorly at middle, dense elsewhere. Abdomen finely and densely punctate, without coarse punctures.

Male characters: legs short and stout, the four anterior tarsi slightly dilated. Middle femur parallel, an obtuse but very distinct angle formed at the outer condyle by the junction of the apical and posterior margins; the middle tibia with its inner margin very feebly and evenly curved throughout its length. Posterior legs very stout; the femur widened apically, its posterior margin finely crenulate throughout, the outer condyle at the junction of the posterior and apical margin produced posteriorly to form a small, slender, very acute tooth; the width of the posterior tibia at apex equal to three-tenths the tibial length.

Holotype— ♂, Thunder River, Que., August 22, 1930, (W. J. Brown); No. 3227 in the Canadian National Collection, Ottawa.

This species is a member of the *obsoleta* group, and may be known by its large size, the distinct hind angles of the pronotum, and by the male sexual characters. The type is evidently a well developed male. The angulate outer condyle of the middle femur, the almost straight middle tibia, and the slender tooth of the hind femur are notable characters.

SCYDMAENIDAE

Scydmaenus subpunctatus Lec. 1, Shelter Bay, June 11.

STAPHYLINIDAE

Megarthrus sp. 2, Bradore Bay, July 5 and Aug. 8.

Anthobium sp. 1, Bradore Bay, Aug. 2.

Anthobium sp. 12, Thunder River, June 19-27.

Anthobium sp. 5, Thunder River, June 19 and 27. The Natashkwan specimen included in the previous list as *pothos* Mann. belongs here.

Phyllodrepa sp. 24, Trinity Bay, Aug. 22, 1929, not included in the previous list; 20, Thunder River, Aug. 15-25.

Olophrum marginatum Makl. (?). 14, Thunder River, Aug. 19-28.

Olophrum sp. 1, Thunder River, June 17.

Acidota sp. (?) 1, Bradore Bay, July 16.

Geodromicus plagiatus Fab. 2, Thunder River, June 19.

Oxytelus insignitus Grav. 1, Thunder River, Aug. 26; 2, Natashkwan, June 22, 1929, recorded previously as *Oxytelus* sp.

Stenus punctatus Er. 1, Thunder River, June 23.

Stenus spp. 3 species represented by 4 specimens, Thunder River, June; 1 specimen of 1 species, Bradore Bay, July 7.

Lathrobium sp. 5, Bradore Bay, July 9 and 15.

Philonthus politus L. 1, Thunder River, Aug. 26.

Philonthus nigritulus Grav. 2, Thunder River, June 23 and 27.

Cafius bistriatus Er. 1, Natashkwan, July 23.

Quedius molochrinus Grav. 1, Bradore, Aug. 7.

Quedius spp. 2 specimens representing 2 species, Bradore Bay, July 7 and Aug. 2.

Bolitobius sp. 1, Thunder River, Aug. 18.

Baryodma ontarionis Csy. (?) 9, Bradore Bay, Aug. 7.

HISTERIDAE

Saprinus dimidiatipennis Lec. 5, Thunder River, June 23 and 27; about 120, Natashkwan, July 25.

CANTHARIDAE

Podabrus simplex Coup. 5, Thunder River, June 18-28.

Podabrus piniphilus Esch. 9, Thunder River, June 16-28.

Cantharis fraxini Say. 8, Thunder River, June 16-23.

Cantharis curtisii Kby. 4, Bradore Bay, July 5-13.

Malthodes niger Lec. 9, Thunder River, June 22-25.

CLERIDAE

Thanasimus undulatus nubilis Klug. 1, Thunder River, June 23.

PYTHIDAE

Salpingus virescens Lec. 5, Thunder River, June 23 and Aug. 19-27.

ANTHICIDAE

Amblyderus pallens Lec. 1, Thunder River, June 23.

ELATERIDAE

Ludius virens Schrank. 2, Thunder River, June 14 and 16.

Ludius resplendens Esch. 1, Thunder River, June 25.

Ludius lobatus Mann. 5, Thunder River, June 13-23.

Ludius mendax Lec. 1, St. Genevieve Island, June 17, 1929; 1, Bradore Bay, July 7; 1, Greenly Island, July 20, 1929; previously recorded as *Ludius* sp.

Eanus decoratus Mann. 11, Thunder River, June 25-28.

Sericus incongruus Lec. 1, Bradore Bay, July 8.

Elater mixtus Hbst. 3, Thunder River, June 16-28.

HELMIDAE

Helmis tardellus Fall. 150, Thunder River, June 16-18 and Aug. 19.

Limnius fastiditus Lec. 1, Thunder River, June 17.

DERMESTIDAE

Byturus unicolor Say. 3, Thunder River, June 19 and 23.

BYRRHIDAE

Tylicus subcanus Lec. 1, Thunder River, June 23.

Simplocaria tessellata Lec. 15, Thunder River, June 23 and Aug. 19-28; 1, Bradore Bay, Aug. 1.

Cytilus alternatus Say. 2, Thunder River, June 27; 1, Natashkwan, July 25.

NITIDULIDAE

Eupraea depressa Ill. 1, Thunder River, June 27.

CRYPTOPHAGIDAE

Cryptophagus sp. 6, Thunder River, Aug. 21-28.

Atomaria sp. 1, Thunder River, June 23.

Anchicera sp. 9, Thunder River, June 23 and Aug. 22-28.

LATHRIDIIDAE

Lathridius laevior n. sp.

Male. Length 2.1 mm.; width .93 mm. Elongate and slender, the elytra somewhat produced behind. Dark reddish-brown, the elytra, antennae, and legs pale reddish-brown; entire surface rather dull.

Front densely, not coarsely punctate; the median sulcus feebly impressed anteriorly, absent on median part, and in the form of a broad, shallow depression at base; the tempora parallel, half as long as the eyes, their angles right and scarcely rounded; the antennae slender, not quite attaining the pronotal base, all the segments longer than wide except the tenth which is as wide as long, the antennal club 3-segmented.

Pronotal length equal to .9 the width; the anterior pronotal angle strongly lobed, the lobe occupying the apical third, the sides parallel posteriorly, the width at base very slightly greater than at middle. Disk densely, not coarsely, and irregularly punctate, the two costae parallel, very fine and not strongly elevated, distinct only in basal half, obsolete anteriorly where the disk is broadly flattened at middle; a deep, sublateral fovea on each side just behind the middle; the side margins not reflexed.

Elytra not quite twice as wide as the pronotum, elongate; the humeri prominent; the disk not impressed at base; the sides evenly and moderately arcuate, explanate except near apex; the striae very feeble and not impressed at base, obsolete apically, the sutural alone entire; the strial punctures not coarse, distinct at base, indistinct at middle, and absent in apical third except on the sides; the intervals much wider than the strial punctures, flat, the third very feebly convex at base.

Metasternum and abdomen subimpunctate; the former with indistinct rugae radiating from deep post-coxal foveae.

Male characters: anterior femur with a very acute, conical tooth at the trochanter. Anterior tibia slightly curved in apical third and with a small, very acute tooth on inner margin near apex. Middle tibia straight, not modified. Posterior tibia straight, the inner margin slightly swollen and with several minute denticles at apical fifth.

Holotype— ♂, Bradore Bay, Que., July 5, 1930, (W. J. Brown); No. 3217 in the Canadian National Collection, Ottawa.

This very distinct species is allied to *lardarius* DeG. and agrees well in form with a female specimen of the latter from the Queen Charlotte Islands. In *lardarius*, the anterior pronotal angles are less strongly lobed, the pronotal punctures are much coarser and the elytra are polished and distinctly striate and punctate throughout. As far as I can determine, the male sexual characters of *laevior* are unique and will separate the species from all others of the genus.

Corticaria serrata Payk. (?). 1, Thunder River, Aug. 26.

Melanophthalma cavicollis Mann. 3, Thunder River, June 23 and Aug. 21.

COCCINELLIDAE

Coccinella transversoguttata Fald. 2, Thunder River, June 16 and Aug. 21.

ANOBIIDAE

Caenocara scymnoides Lec. 1, Thunder River, Aug. 28.

SCARABAEIDAE

Aegialia lacustris Lec. 3, Thunder River, June 13 and 22; 38, Bradore Bay, July 9-16 and Aug. 7.

Aphodius leopardus Horn. 6, Thunder River, June 25 and Aug. 22; 4, Bradore Bay, Aug. 1 and 4.

Dichelonyx canadensis Horn. 7, Thunder River, June 13-28.

CERAMBYCIDAE

Criocephalus agrestis Kby. 2, Thunder River, June 23 and Aug. 19.

Acmaeops pratensis Laich. 2, Thunder River, June 27 and 28; 1, Bradore Bay, July 5.

CHRYSOMELIDAE

Haltica evicta shoemakeri Schaef. 30, Thunder River, June 13-28 and Aug. 21-28.

Crepidodera robusta Lec. 3, Thunder River, June 14.

CURCULIONIDAE

Notaris bimaculatus Feb. 2, Thunder River, Aug. 20; 1, Natashkwan, July 25; 4, Bradore Bay, July 9 and Aug. 7.

Anthonomus rufipennis Lec. 7, Thunder River, June 14-25 and Aug. 18.

Cleonus plumbeus Lec. 24, Thunder River, June 10 and Aug. 20.

Rhinoncus pyrrhopus Boh. (?) 11, Thunder River, June 25 and Aug. 14-23.

SCOLYTIDAE

Determined by Dr. J. M. Swaine.

Polygraphus rufipennis Kby. 13, Thunder River, June 25.

NEW SPECIES OF NORTH AMERICAN EPHEMEROPTERA II*

BY J. McDUNNOUGH,
Ottawa, Ont.

Leptophlebia strigula n. sp.

Male. Very similar in all respects to *guttata* McD. but noticeably larger in size. Thorax deep blackish, tinged with brown in the pleural sutures. Abdomen with segments 2-6 and anterior portion of 7 whitish, hyaline, with considerable brownish shading on 2. In place of the lateral black dots of *guttata* there is a short black transverse streak in the postero-lateral corner of segments 2-6 with some slight brown suffusion anterior to it, especially on segment 2. Rear segments deep chocolate-brown. Setae and forceps whitish, faintly tinted with brown at base. Legs whitish; fore femora tinged with brown throughout, mid- and hind femora only apically with the knee decidedly brown. Wings hyaline with pale venation. The genitalia are very close to those of *guttata* (Can. Ent., 1924, LVI, 91, Pl. 1, fig. 8) but the penes are convergent, not divergent, at their apices, the beak-like lateral projections are somewhat shorter and the ribbon-like stimuli are longer.

Female. Head red-brown, with black shading on vertex. Thorax and abdomen deep red-brown. Legs pale amber. Wings hyaline with the longitudinal veins faintly amber-colored. The subanal plate has a deep, narrow U-shaped excision. Length of body 7 mm.; of forewing 7 mm.

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*Contribution from the Division of Systematic Entomology, Entomological Branch. Dept. of Agric., Ottawa.

Holotype—♂, Dundas, Ont., May 31, (G. S. Walley); No. 3382 in the Canadian National Collection, Ottawa.

Allotype—♀, same data.

Paratypes—10 ♂, same data (two bred from nymph); 3 ♂, Jordan, Ont., June 21, 25, 1926, (G. S. Walley).

The flight of this species apparently occurs about two weeks earlier in the spring than that of *guttata*. At Dundas in 1931 no specimens of the latter species were seen, whilst at Jordan, in 1926, when *guttata* was very plentiful, only three specimens of *strigula*, representing probably stragglers, were secured.

Mr. Walley was successful in bringing several nymphs through to maturity and has prepared the following notes on this stage:—

"*Nymph. Size, general form and color*—Length of body, male 6.5 mm., female 7.5 mm., caudal setae, male 6.0 mm., female 10.0 mm. A larger, stouter nymph than *L. guttata* McD. with the head slightly narrower in proportion to the rest of body and the abdomen broader and not tapering so distinctly posteriorly as does *guttata*. In nature the mature nymphs are a bright coffee brown except for the black wing pads and pale appendages. The brown color is preserved but duller in the alcohol specimens described below.

Head and Mouth parts—Brownish, with traces of darker shading on vertex. Antennae and mouth parts creamy yellowish. The ocelli indicated by creamy dots surrounded by a dark brownish ring which is sub-integumental.

The maxillae resemble those of *guttata*. Both species have the palpi considerably elongate but in *strigula* the segments, particularly the second, are distinctly stouter than in *guttata*. The labial palpi have the apical segment slightly more elongate than in *guttata* but in both species this segment is unusually short as compared with the *L. mollis* type figured by Ide (Can. Ent., 1930, LXII, 208, pl. 17, fig. 4b).

Thorax—Pronotum dusky brown with slightly paler lateral margins. Mesonotum brownish, sometimes with an elongate triangular median dash and one or two lateral blotches of paler brown and in mature specimens often with indications of darker brown sub-integumental dashes. Legs entirely pale.

Abdomen—Tergites brown with lateral margins paler, anterior 5 or 6 tergites with a faint oblique pale dash on either side at base, posterior tergites with a very obscure interrupted median streak. Postero-lateral angles of gill bearing segments with a blackish *streak* along the margin. In *guttata* nymphs this streak is replaced by a small blackish spot and in both species the character is preserved in the adult. Venter paler brown with faintly darker patches on either side especially on apical sternites. Gills as in *guttata*. Caudal setae pale brown."

Pseudocloeon parvulum n. sp.

Male. Turbinate eyes (dried) deep reddish, decidely more oval than in *dubium* where they are almost circular. Thorax black-brown. Abdomen with the first six segments dull hyaline whitish with a slight smoky or pale amber suffusion (not the pure white of *dubium*); traces of a fine, geminate, ruddy mid-dorsal line and a series of five rather large diffuse, lateral, ruddy or claret-colored patches, one on each of segments II-VI, that of IV being less distinct than the others (at times obsolescent); tracheae along lateral edge marked

in black. Last four segments dorsally light chocolate-brown, ventrally opaque whitish with a brownish tinge, deepest on lateral portion of segment IX; forceps pale with the basal joint suffused with light sepia-brown and the terminal joint short and stubby, scarcely longer than broad and quite distinct from the much longer joint of *dubium;* setae whitish. Fore femora smoky with slight amber tinge, tibiae and tarsi smoky white. Mid and hind femora pale, very faintly amber-tinted with a *ruddy dash on lower edge anteriorly* and a distinct, ruddy, lateral spot near apex and well beyond middle of joint; tibiae and tarsi whitish. Wings hyaline with slight black-brown tinge at extreme base; venation pale; pterostigmatic crossveins few in number, with no intervening granulations.

Female. Front and head and base of antennae rather a bright brown; vertex of head behind ocelli light yellowish, suffused over the median area with light brown of a rather ochreous tinge, leaving the yelllowish color adjacent to the eyes. Thorax light brown. Abdomen dorsally light brown with a yellowish tinge, deeper in color laterally, due probably to darker patches corresponding to the ruddy patches in the male; ventrally pale yellowish. Legs pale yellowish, fore femora largely suffused with bright brown; mid and hind femora with the ruddy streak and spot of the male sex. Wings hyaline with pale venation. Length of body 3 mm.; of forewings 3.5 mm.

Holotype— ♂, Tillsonburg, Ont., June 4, 1926, (G. S. Walley); No. 3391 in the Canadian National Collection, Ottawa.

Allotype— ♀, same data, June 5.

Paratypes—23 ♂, 20 ♀, same data, June 4, 5.

The species is one of the smallest known; the larger spring generation is about the size of the second, summer one, of *dubium,* and the summer generation, of which a single male was secured at Kazubazua, Que. by Mr. W. J. Brown, is extremely minute.

It appears to be widespread and quite variable in regard to the red spotting of the abdomen. While my entire Tillsonburg series shows these red blotches very clearly I have a series before me from Niagara Falls, Ont., taken in late July, some of which are well-maculate whereas others have lost all trace of the red abdominal spots. Most of these immaculate specimens still show the red ventral dash on either the mid or hind femora; as there is further no difference in the male genitalia I consider them to be merely poorly-marked specimens of *parvulum.* The same remark applies to a series before me from Milk River, Alta. (July, August) only a few specimens showing any traces of ruddy spotting, the majority being a dirty whitish in respect to the color of the first 6 abdominal segments and only definitely separable from specimens of *dubium* from the same region by the more oval turbinate eyes and the male genitalia. Nymphs from the Milk River correspond with eastern nymphs mentioned in the following paragraph. The larger *rubrolaterale* McD. from the same locality has much more extended ruddy abdominal suffusion than even typical *parvulum* and is at once distinguished by the medio-ventral dark dots.

Although a definite association was not made, what I believe to be the nymph of this species was found by Messrs. Brown and Walley at Tillsonburg in early June 1931, at a time when subimagos of *parvulum* were emerging from

the stream; similar mature nymphs were taken at Kazubazua, Que., by Mr. Brown in August, 1931 at the spot where the small specimen, mentioned above, was captured, no other mature nymphs being found in either locality at the time.

The *nymph* is a very slender, delicate creature and is at once distinguished from others of the genus by the fact that the setae are alternately banded with pale and dark color as in *Ecdyonurus* nymphs. The abdomen is brown with a mediodorsal row of pale spots, one on the anterior margin of each segment; in well-marked specimens there are two lateral anterior dots each side of the median dots and further a pale latero-posterior spot. In the females these spots are often obscure, but in the males, as is usual in the genus, they tend to expand and coalesce so that segments 4, 8 and 9 are largely pale, with a median quadrate dark patch on 4 and subdorsal dark streaks on 8 and 9. In the legs the femora show moderately long hair on the dorsal edge; they are largely dark, with pale patches, the tibiae and tarsi with the apical section brown. The gills are large, oval, pale, with a distinctive dark subapical patch and a median black trachea which usually gives off a single short branch at base.

The nymphs of *punctiventris* McD. and *virile* McD. are now also known, single female specimens having been bred by Mr. Walley and myself at Miner's Bay, near Minden, Ont. in May, 1931 and the nymphal skins secured. Of *punctiventris* a mature male nymph was also taken, the midventral spots showing up subcutaneously (these spots do not persist in the nymphal skin). No further *virile* nymphs were found at Miners' Bay, but a few from the Moira river at Belleville, Ont. seem to match the nymphal skin before me. The following key, largely based on male nymphs, will augment that given in this journal recently (1931, Vol. LXIII, p. 85). The number of species in this genus is apparently not yet exhausted as there are several unassociated series of nymphs before me from various eastern localities which do not match any species given in the key.

KEY TO KNOWN NYMPHS OF PSEUDOCLOEON SPECIES

1. Two caudal setae alternately banded with light and dark ....*parvulum* McD.
   Two caudal setae otherwise 2
2. Caudal setae with median dark band 3
   Caudal setae unbanded 5
3. Abdominal segments, especially in ♂, with strong color contrasts; segments 3, 4, 8-10 being largely pale, others dark; 9 with a dark lateral dash....
   .....*dubium* Wlsh.
   Abdominal segments largely dark; no lateral dash on 9 4
4. Rear abdominal segments with traces of pale dorsal band; usual dark subdorsal and subventral dots distinct; anterior segments with pale subdorsal dots; medioventral dark dots of adult present...*punctiventris* McD.
   Rear abdominal segments with dorsal pale band; dark dots obscure; pair of subdorsal pale spots on anterior portion of each segment; no medio-ventral dark dots .....*virile* McD.
5. Short, chunky species with broad thorax; long hairs on dorsal margin of femora and tibiae; first eight abdominal segments almost entirely dark

.....*carolina* Bnks.

More elongate species; hairs on femora considerably shorter; abdomen paler with segments 4 and 8-10, particularly in ♂, frequently pale .....
.....*cingulatum* McD.

In conclusion it might be noted that nymphs of *Heterocloeon curiosum* McD. fall into the section with unbanded caudal setae, but may be distinguished by the fact that the gills are largely blackish with a narrow pale border.

Genus **Baetisca** Walsh

In working over the species of this genus in our collections in connection with Miss Traver's recent paper (1931, Jour. N. Y. Ent. Soc., XXXIX, 45) I find two undescribed species, both of which have been definitely associated with the nymphal stages. I am further able to record the occurrence of what I believe to be *carolina* Traver at Knowlton, Que.; nymphs were taken by Mr. W. J. Brown in Knowlton Creek, about 3 miles south-east of town in 1928 and a male and female secured at the same place on June 14 and 16. Miss Traver, who has examined specimens of the nymphs, states that they differ from those of *carolina* in having less sharp lateral spines and in lacking the large black spots on the abdomen behind the gills; such differences, however, I can hardly regard as specific in view of similar variation in other material before me and as the adults agree very nicely with the characterization I am holding them for the present under this name. We also have a single immature nymph from Kazubazua, Que., taken in August, 1931, by Mr. Brown, which corresponds to the diagnosis of *callosa* Traver. It is evident that the nymphs on which the description of *callosa* was based were very immature and in all probability neither these nor our Kazubazua one would have reached maturity and emerged until the spring of the following year; consequently it is impossible to say whether the lack of spining on the mesonotal shield (which is characteristic of *callosa* nymph as described) is found in mature nymphs or whether possibly spines may develop during the later nymphal stages; the matter must await future study.

As very excellent characters for specific separation are found in the nymphs I offer the following key to those species of which the early stages are known; this includes the two undescribed species above mentioned but omits *rubescens* Prov., the early stages of which are still to be discovered.

KEY TO KNOWN SPECIES OF BAETISCA NYMPHS

1. Mesonotal shield without either dorsal or lateral pairs of spines.....
.....*callosa* Traver

   Mesonotal shield with at least lateral pair of spines present.....2

2. Both dorsal and lateral spines on mesonotal shield 3

   Only lateral spines on mesonotal shield 4

3. Head with a pair of prominent frontal projections.....*obesa* Say

   Head with frontal projections reduced to very small, blunt tubercles
.....*laurentina* n. sp.

4. Head with genae produced into sharp, upcurved spines; no frontal tubercles .....*carolina* Traver

   Head with genae not produced into spines; two small rounded frontal tubercles; lateral spines of shield very long and sharp.....*lacustris* n. sp.

Baetisca laurentina n. sp.

Male. Entire insect dorsally deep brown with the lateral, somewhat flange-like, edge of the mesonotum paler; thoracic sternum deep brown; abdominal sternites paler brown with the forceps dull dirty amber-colored; setae pale brownish, ringed intersegmentally with darker. Wings hyaline, the longitudinal veins brown, the crossveins pale, scarcely visible except in the anal area. Legs dull amber, the prothoracic pair rather deeper in color than the two hinder pairs.

Female. Very similar to male in coloration but with the head and prothorax slightly paler brown than the remainder of the body. The wing venation is also paler. Length of abdomen 8 mm.; of forewing 10 mm.

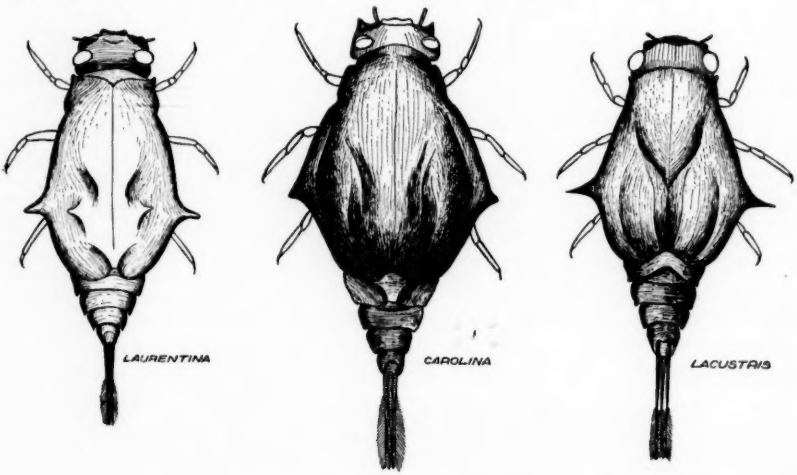
Subimago. Color much as in adults. Wings varying from almost black with fine hyaline reticulations to a pale-banded form in which the median and terminal areas show bands and streaks of pale color.

Holotype— ♂, Lachine, Que., June 6, 1930, (G. S. Walley) (bred from nymph); No. 3383 in the Canadian National Collection, Ottawa.

Allotype— ♀, same data, June 7.

Paratypes—3 ♂, same locality and collector, June 6, 8.

A number of specimens from Ottawa, Ont. and a single male from Fredericton, N. B. probably also belong here but without nymphs from these localities I refrain from including them in the type series.



In the adults the species is separable from *obesa* Say (as represented in our collection by one of Walsh's specimens) by the dark longitudinal venation. The nymphs should be readily recognized by the characters given in the key and in the accompanying illustration.

Baetisca lacustris n. sp.

Male. Dorsally brown, tinged with ruddier brown on the apical abdominal segments. Thoracic sternites pale brown; abdominal sternites, forceps and legs pale yellowish-white. Setae whitish, unbanded. Wings hyaline with entirely pale venation.

Female. Somewhat paler than the male but in general with similar coloration. Length of body 7 mm.; of forewings 8 mm.

Subimago. Body coloration as in adult. Wings much less heavily reticulate with black than in preceding species, the dark color more or less confined to the median area of primaries where it forms a transverse band and to the apical section of both primaries and secondaries. At times the dark color is much reduced so that the subimago appears almost unmottled.

Holotype—♂, Pelee Island, Ont., July 3, 1931, (G. S. Walley); No. 3384 in the Canadian National Collection, Ottawa.

Allotype—♀, Leamington, Ont., June 24, 1931 (W. J. Brown).

Paratypes—15 ♂, Pelee Island, July 3, 1931, (Walley and Brown); 2 ♀, Fisher Glen, Ont., June 12, 1931, (W. J. Brown); 3 ♀, Pt. Pelee, Ont., June 19, 24, 1925, (G. S. Walley); 1 ♀, Pt. Pelee, Ont., June 29, 1931, (W. J. Brown).

Numerous cast nymphal skins of this species were found along the shore of Lake Erie in the vicinity of Normandale, Ont. and a mature nymph found in a pool in the same region was bred to a subimago which corresponded to the subimagos found on Pelee Island and in the Pt. Pelee region. Similar nymphal skins were also found at Southampton on Lake Huron and an examination of Clemens' material from the Georgian Bay shows that it was this species he recorded (1913, Can. Ent. 333) under the name *obesa* Say. It is evident that we are dealing with a species indigenous to the Great Lakes. A small series of adults from Treesbank and Aweme, Man., also appears to belong here but I have no knowledge of the nymphs.

The striking difference between the dark upper and the pale underside of the adult abdomen together with the entirely hyaline wings should identify the species readily. The male genitalia are very similar throughout the genus and offer no characters which can be used satisfactorily to separate species.

A NEW SPECIES OF CICINDELA FROM ILLINOIS (COLEOP.)

BY EMIL LILJEBLAD
Field Museum of Natural History, Chicago

Cicindela alata n. sp.

Somewhat similar to *C. celeripes* Lec, but with fully developed wings. Brownish bronzed, the punctured part on the elytra greenish white or greenish blue; antennae with four basal joints bronzed, apical joints dark, hairy; palpi pale, yellowish, apical joints dark at tip; elytral markings grayish white, somewhat variable, but usually with a narrow marginal line or dash at middle, an apical line or lunule, the marginal line usually connected with the apical lunule, twelve of the thirty-three specimens have an indication of a humeral lunule and trace of a median spot, suggesting that a median band may be found on some future specimens. Head large, longitudinally rugose between the eyes, granulate at base, not hairy; labrum large, with usually one well developed tooth in the middle of the front margin. Prothorax about as broad as long, semicylindrical, as broad at middle as apex, about one-fifth narrower at base; upper surface finely granulate, with sparse whitish hairs; underside rugose, shining with more dense hairs near and on the coxal plates. Elytra about twice as long

as broad, broadest behind the middle, surface reticulate and with small fovea-like punctures, on the whitish markings the punctures become finer and not fovea-like; the sides of the male elytra terminating gradually to apex, in the female the apex is more widely rounded to the sutural spine; underside finely aciculate, with somewhat dense white hairs on the sides of the metasternum and abdominal segments. Length 8, 5--9 mm.

Holotype; male, Chicago, Illinois, June 13, 1932, Wm. J. Gerhard; in collection of Field Museum of Natural History, Chicago, Illinois.

Allotype; female, same locality, June 24, 1932, Wm. J. Gerhard; in collection of Field Museum of Natural History.

Paratypes; 15 males, 16 females, same locality, June 13—July 11, 1932; Wm. J. Gerhard; ten, in collection of Field Museum.

The main differences separating this insect from *Cicindela celeripes* Lec., which it at first sight resembles, is that it has fully developed wings—not aborted—; the prothorax is more strongly rounded at middle, making the shape less cylindrical; and the elytra gradually taper from a little beyond the middle to apex, whereas in *celeripes* Lec., the elytra are extended beyond the sutural angle, making the apex of the elytra oblique towards the base of the sutural spine.

This interesting, little tiger beetle, which so far as the writer knows, is the smallest cicindelid ever found in the Chicago region, was collected by Mr. Wm. J. Gerhard in his back yard in the southern section of the city.

Mailed Monday, October 3rd.